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(54) Title: A METHOD OF SPEEDING UP THE REGISTRATION PROCEDURE IN A CELLULAR NETWORK
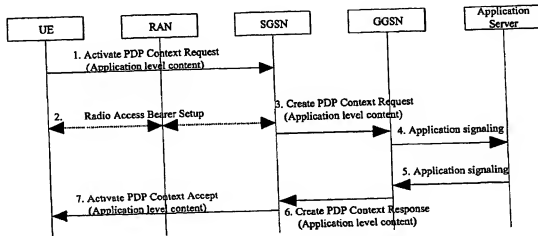
(57) Abstract: A method of carrying an application level message encapsulated inside a signaling message of an access network, said
method comprising the steps of: receiving (1) an application level message from a sender application process to an access network
signaling process; adapting (3) said application level message and encapsulating it in a signaling message of an access network;
and delivering (1, 3, 4) said encapsulated application level message to a receiver application process by transmitting said signaling
message, wherein said encapsulated application level message is transparent to the means of said access network transmitting said
signaling message.

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A method of speeding up the registration procedure in a
cellular network

Field of the Invention

5   The present invention relates to a method of speeding up
the registration procedure in a cellular network.

Prior Art

10   The current wireless networks need a separate message to
manage the connectivity to an external network, e.g. get
connected to the network (PDP context activation), and to
register with a given application, e.g. the Session
15   Initiation Protocol (SIP) register procedure for the
Voice over Internet Protocol (VoIP) or instant messaging,
etc. This implies that two round trip delays (over the
radio distance) minimum are needed before the application
becomes available.

20   In a cellular network, sending a packet does not only
imply the physical transmission time of a packet over the
radio, but also the time to establish radio resources.
This time can be significant (seconds), as is known from
25   the live network behavior of General Packet Radio Systems
(GPRS).

In addition, in a typical mobile terminal, the Packet
Data Protocol (PDP) context is started when an
30   application that may need this Packet Data Protocol (PDP)
context is started. At this time this application already
has the information it needs to register (even if the
destination may be a logical name instead of an IP
address).

35

The following two possibilities serve as examples.

A Packet Data Protocol (PDP) context may be established
first, and then an application level message would be
5 sent which however adds a second round trip delay over
the radio distance.

Another one is to send a Remote Authentication Dial-In
User Service (RADIUS) start message from a Gateway GPRS
10 Support Node (GGSN) when a Packet Data Protocol (PDP)
context is established. However, this does not allow the
mobile terminal to send information which is specific to
it (the mobile terminal's capabilities; the type of push
service wanted; an instant messaging group to join; its
15 signature; application settings etc.) and requires a
pre-configuration of all application servers in the
Gateway GPRS Support Node (GGSN).

Another important design criteria in a cellular network
20 is to maintain the access network (e.g. of GPRS type)
quite independent from the applications, so that new
applications can be added transparently to the access
network.

25 Summary of the Invention

Therefore, it is an object of the present invention to
deal with the problems of the prior art, and to provide a
method of speeding up the registration procedure in a
30 cellular network.

According to the present invention, this object is solved
by providing a method of carrying an application level
message encapsulated inside a signaling message of an
35 access network, said method comprising the steps of:

receiving an application level message from a sender
application process to an access network signaling
process; adapting said application level message and
encapsulating it in a signaling message of an access
5   network; and delivering said encapsulated application
level message to a receiver application process by
transmitting said signaling message, wherein said
encapsulated application level message is transparent to
the means of said access network transmitting said
10   signaling message. Advantageous modifications are defined
in the appended dependent claims.

Hence one or many encapsulated application level messages
are included in the Packet Data Protocol (PDP) context
15   signaling (e.g. especially in the activation request), so
that if the Packet Data Protocol (PDP) context is
accepted, gateway node means (e.g. the Gateway GPRS
Support Node (GGSN)) will send the application level
message on behalf of the mobile terminal to an
20   application server (e.g. a Proxy Call State Control
Function (P-CSCF); a push proxy server (e.g. Wireless
Application Protocol (WAP) gateway) or an instant
messaging server).

25   In particular, the method according to the present
invention allows with only one round-trip over the radio:
• to establish one Packet Data Protocol (PDP) context and
register in one or more application; or
• to establish one secondary Packet Data Protocol (PDP)
30   context and to send a ringing indication to the other
party; or
• to modify a Packet Data Protocol (PDP) context and
signal the Quality-of-Service (QoS) change to the other
end; or

- to deactivate the Packet Data Protocol (PDP) context
  and de-register from an application.

The present invention is presently considered to be
5 particularly applicable to a Session Initiation Protocol
   (SIP) signaling, but also to other signaling such as a
   Resource Reservation Protocol (RSVP) signaling, or to a
   Point to Point protocol (PPP) signaling.

10 According to the present invention, the registration
    procedure in general is speeded up. Moreover, the method
    according to the present invention is especially
    efficient to speed up a call establishment procedure for
    Voice over IP (VoIP) as it can be applied also when a
15 Real-Time (RT) secondary Packet Data Protocol (PDP)
    context is established.

    As a consequence, the delay is reduced. Further, the
    radio and the backbone is optimized by reducing the needs
20 for radio signaling and reducing the number of packets
    sent.

    A key feature of the present invention is to maintain
    logical independence between the application layer (e.g.
25 SIP or WAP - Wireless Application Protocol) and the
    access layer (e.g. GPRS). This independence is based on
    the fact that the access layer does not need to
    understand application signaling. It only needs to know
    how to forward it. Therefore, any new application could
30 obtain the benefit of this functionality without further
    changes needed in the access layer.

    According to the present invention, the present object is
    further solved by providing a system adapted to perform a
35 transmission of an application level message encapsulated

inside a signaling message of an access network,
comprising: receiving means adapted to receive an
application level message from a sender application
process to an access network signaling process; adapting
5 means for encapsulating said application level message in
a signaling message of an access network; and delivering
means adapted to deliver said encapsulated application
level message to a receiver application processing means.

10 Brief Description of the Drawings

Further details of the present invention will become
apparent from the following description of the preferred
embodiments which is to be taken in conjunction with the
15 appended drawings, in which:

Fig. 1 shows a comparative example illustrating a VoIP
signaling based on existing knowledge depicting a GPRS
attach, a signaling for a Packet Data Protocol (PDP)
20 context activation, a Proxy Call State Control Function
(P-CSCF) discovery, and a Session Initiation Protocol
(SIP) registration;

Fig. 2 shows another comparative example illustrating a
25 VoIP signaling based on existing knowledge depicting the
signaling foreseen to establish a call;

Fig. 3 shows a Packet Data Protocol (PDP) context
activation according to the present invention; and

30 Fig. 4 shows the encapsulated application level message
information element according to the present invention.

Description of the preferred Embodiments

35

At first, reference is made to the comparative example depicted in figures 1 and 2, illustrating a current view of VoIP signaling based on existing knowledge.

5   In these figures, DNS denotes a directory name service, and DHCP denotes a dynamic host configuration protocol, while UE denotes a user equipment such as a mobile terminal. Other denotations are explained elsewhere in the present description.

10   A rough count reveals a minimum of 25 messages over the radio distance including Radio Resource Control (RRC) messages which are not depicted here for a mobile terminal UE to fixed phone call, when starting with a
15   turned off mobile terminal UE; and at least 40 messages over the radio distance for a mobile terminal UE(A) to mobile terminal UE(B) call, if the called mobile terminal UE(B) is not Radio Resource Control (RRC) connected.

20   From this realization, it becomes clear why there is a need to optimize the delay.

It is remarked that according to the present invention, as will be apparent from the description given below, a
25   gain of four to five messages may be obtained over the radio distance, since Session Initiation Protocol (SIP) registration messages can be embedded in a Packet Data Protocol (PDP) context activation request/response, and "COMET"-/"200OK"-messages can be embedded in step 19 (a
30   secondary Packet Data Protocol (PDP) context activation request/response), while the ringing messages can be embedded in step 24 (secondary PDP context activation request). The details of embedding are described below.

A further gain can be achieved if there is a need to modify the bearer (step 33-38) or if the external resources reservation requires an end to end, i.e. mobile terminal to mobile terminal, signaling based on the
5 Resource Reservation Protocol (RSVP).

Next, reference is made to fig. 3 which shows a Packet Data Protocol (PDP) context activation as a preferred embodiment according to the present invention.

10 Firstly, an application (inside the mobile terminal or in a separate device such as a laptop) requests the mobile terminal UE to initiate a Packet Data Protocol (PDP) context activation. In the same time, the application
15 provides to the session management stack of the mobile terminal UE (this is the software in charge of activating the PDP context) an application level message. This application level message which is to be encapsulated may be a complete message such as a SIP registration message
20 or a request to establish a WAP session. The mobile terminal UE adds the information provided by the application in an optional Information Element (IE) which shall be called "encapsulated application level message IE" in the PDP context activation request
25 message. The thus encapsulated application level message is then transparently forwarded by the Serving GPRS Support Node SGSN to the GGSN in the Create PDP Context Request. Here, the term "transparently forwarded" implies that the optional encapsulated application level message
30 information element is copied from one message to the other without being interpreted by the SGSN. This Packet Data Protocol (PDP) context may be a normal PDP context, a signaling PDP context or a secondary PDP context.

Secondly, the Radio Access Bearer (RAB) is set up. It should be noted that step 2 and 3 may be performed in a different order or even in parallel without modifying the idea of the invention.

5 Thirdly, the Serving GPRS Support Node SGSN sends the Create PDP Context Request message to the selected Gateway GPRS Support Node GGSN. According to the above, also this message includes the optional encapsulated application level message information element.

10 When receiving the request, the GGSN will interpret the encapsulated application level message information element. The encapsulated application level message information element indicates which information should be

15 sent to which destination address, i.e. a logical name or IP address, and under which condition, for example, if the Packet Data Protocol (PDP) context is accepted; if the Packet Data Protocol (PDP) context is accepted with

20 the requested Quality-of-Service (QoS) (Here, the GGSN firstly processes the PDP context request normally. If the output is that the PDP context is accepted (with the same Quality-of-Service in option 2), it sends the application level message forward. If the PDP context is

25 rejected, (or the Qulaity-of-Service is modified in option 2) the application level message is then just erased) if the response should be sent immediately or only when the application server response is received; etc. If the destination address is indicated as a logical

30 name (e.g. "SIPproxy" or "WAPgateway"), the GGSN resolves a logical name from its configured data (e.g. Access Point Name (APN) configuration) or by querying the Directory Name Service DNS system. The GGSN extracts the content from the encapsulated application level message

35 and forwards it, in step 4, to the application server by

using information sent in encapsulated application level
message information element, and/or information coming
from the PDP context and/or information coming from
configuration. Preferably, the GGSN uses the IP address
5 of the Packet Data Protocol (PDP) context as source
address.

In a particularly preferred embodiment, the application
level option includes a complete Session Initiation
10 Protocol (SIP) message. The Gateway GPRS Support Node
GGSN just has to create the IP/UDP (User Datagram
protocol) header, and to forward the message to the SIP
proxy. The creation of the IP/UDP header is made by using
information sent in an optional encapsulated application
15 level message information element (for details, see the
description related to figure 4), and/or information
coming from the PDP context (e.g. PDP type indication if
IPv4 or IPv6 should be used; source address is the UE IP
address) and/or information coming from a configuration
20 (e.g. a destination address may be derived from logical
name).

If the application level option indicated that the GGSN
should send the Create PDP Context Response only when the
25 application server response is received, the GGSN will
start a timer to wait for answer. If a reply from the
application server is received before the timer expires
(step 5), this reply or part of it is copied into the
application level option information element (IE) of the
30 Create PDP Context Response. If no reply is received
before the timer expires, Create PDP Context Response is
sent with an indication "server not answering".

If the application level option indicated that the GGSN
35 should send the Create PDP Context Response immediately,

step 5 is omitted and the GGSN sends a Create PDP Context
Response. The reply from the server will naturally be
sent to the IP address of the mobile terminal UE and be
carried over to the PDP context as normal IP traffic.

5   In step 6, the GGSN sends a Create PDP Context Response,
       containing an indication that the application level
       option has been understood. This indication may be a new
       application level option containing information returned
10   by the application server, an indication that the
       encapsulated application level message has been
       successfully forwarded (e.g. cause "application level
       option successful"), or an error indication (e.g.
       "unknown logical name"; "unreachable destination
15   address"; "invalid application level option format";
       "server not answering"). This indication is coded as a
       new optional information element IE.

       In step 7, the SGSN sends the Activate PDP Context Accept
20   containing the same indication received from the GGSN.
       The SGSN shall not interpret this indication, but only
       copy the indication received in the Create PDP Context
       Response into the Activate PDP Context Accept message.

25   When receiving the Activate PDP Context Accept, the
       mobile terminal UE informs its application process that
       the PDP context activation was successful and provides
       the indication to the application process. As mentioned
       earlier, this indication may be an application level
30   option containing information returned by the application
       server, or an application level cause indicating success
       or failure.

       This indication is needed in order to support backward
35   compatibility. The reason is that a mobile terminal UE

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cannot know if a network (i.e. both SGSN and GGSN)
supports the feature as proposed according to the present
invention. If the SGSN does not support the feature, the
new optional information element IE as proposed will not
5 be forwarded to the GGSN. Therefore, the GGSN will behave
normally and not send back any indication to the SGSN
about the application level. The SGSN is not sending any
indication to the mobile terminal UE. Hence, the mobile
terminal UE will also not pass any indication to the
10 application process. The application will then know it
has to resend its application as normal traffic (e.g. a
IP/UDP/SIP packet over the established PDP context).

If the GGSN does not support the proposed functionality,
15 it ignores the unknown optional information element IE,
and correspondingly does not return any indication to the
SGSN. The SGSN is not sending any indication to the
mobile terminal UE. Thus, the mobile terminal UE will not
pass any indication to the application process. The
20 application will then know it has to resend its
application as normal traffic (e.g. a IP/UDP/SIP packet
over the established PDP context).

Therefore, according to the above, if the SGSN or the
25 GGSN does not support the proposed functionality, the UE
and the application will behave as currently, even if the
benefit of the proposed functionality is obviously lost.
However, this kind of compatibility is an advantage of
the present invention.

30
Other alternative implementations are possible such as
having a full IP packet embedded in the session
management (SM) signaling in the optional information
element IE which would be good for the IP security
35 protocol (IPsec). It should be noted that this solution

would work in the Activate PDP Context Request message
only if a static address is used, as the mobile terminal
UE would not yet know its address. However, this
alternative implementation can be used also with a
5 dynamic address in all the other session management (SM)
messages (e.g. Activate PDP Context Response; Activate
Secondary PDP Context Request; Modify PDP Context
Request). Another option is to have only an Extensible
Markup Language (XML) extension carried in the
10 application level option information element between the
mobile terminal UE and the GGSN that the GGSN will always
forward to an application server by using a
pre-configured protocol (e.g. the Session Initiation
Protocol). The GGSN may also add an extension containing
15 other information known about the user (e.g. a user
identity such as MSISDN; Charging ID; APN used; IP
address allocated; etc.).

Encapsulated Application Level Message

20 As a preferred embodiment of the present invention, it is
proposed to change all session management (SM) messages
by adding the new optional information element (IE).

25 In the following, the list of the concerned session
management (SM) messages is given:
   • Activate PDP Context Request
   • Activate PDP Context Accept
   • Activate PDP Context Reject
30 • Activate Secondary PDP Context Request
   • Activate Secondary PDP Context Accept
   • Activate Secondary PDP Context Reject
   • Request PDP Context Activation
   • Request PDP Context Activation Reject
35 • Modify PDP Context Request

- Modify PDP Context Accept
- Modify PDP Context Reject
- Deactivate PDP Context Request
- Deactivate PDP Context Accept

5 Specified below is the format of the "Activate PDP Context Request" according to the present invention. That is, specified are the changes to the existing knowledge as proposed by the present invention as an embodiment 10 thereof. Thus, an example of the format of the new information element according to the present invention is presented:

Activate PDP Context Request

15 This message is sent by the UE to the network to request activation of a PDP context.
See table below.

20 Message type: ACTIVATE PDP CONTEXT REQUEST
   Significance: global
   Direction: UE to network

       Table ACTIVATE PDP CONTEXT REQUEST message content

25

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 10.2	M	V	1/2
	Transaction identifier	Transaction identifier 10.3.2	M	V	1/2 – 3/2
	Activate PDP Context Request message identity	Message type 10.4	M	V	1
	Requested NSAPI	Network service access point identifier 10.5.6.2	M	V	1
	Requested LLC SAPI	LLC service access point identifier 10.5.6.9	M	V	1
	Requested QoS	Quality of service 10.5.6.5	M	LV	12
	Requested PDP address	Packet data protocol address 10.5.6.4	M	LV	3 – 19
28	Access point name	Access point name 10.5.6.1	O	TLV	3 – 102
27	Protocol configuration options	Protocol configuration options 10.5.6.3	O	TLV	3 – 253
	Encapsulated application level message	**Encapsulated application level message**	**O**	**TLV**	**3 – 1025**

The new information element IE as proposed by the present invention is marked in bold.

Description of the encapsulated application level message

The purpose of the encapsulated application level message
information element is to carry application specific
5   information in session management (SM) messages, and to
indicate to the GGSN which generic procedure to use.

The encapsulated application level message is a type 4
information element with a minimum length of 3 octets.
10 The maximum length for the information element IE is 1025
octets. It is to be noted that the information element IE
length restriction is due to the maximum length that can
be encoded by using 10 bits.

15 The encapsulated application level message_information
element is coded as shown in Figure 4.

Below, the behavior of the Gateway GPRS Support Node GGSN
20 is described in more detail.

When the Gateway GPRS Support Node GGSN receives a
session management (SM) message with an encapsulated
application level message, it will first check:

25 1) Sending option conditions
This field indicates the sending of the application level
message:
• "if the PDP context is accepted", in which case the
30   Gateway GPRS Support Node GGSN sends the application
level message as soon as the Packet Data Protocol PDP
context is accepted;
• "if the Packet Data Protocol PDP context creation or
modification is accepted with the Quality-of-Service
35   (QoS) requested"; in which case the Gateway GPRS

Support Node GGSN sends the application level message
only if the Quality-of-Service (QoS) requested by the
mobile terminal UE was accepted unchanged (it is
remarked that this may require a new indication from
5   the Serving GPRS Support Node SGSN to indicate what was
the Quality-of-Service QoS requested by the mobile
terminal UE). If the Quality-of-Service (QoS) was not
accepted as such, the application level option is
ignored (the mobile terminal UE will detect the change
10 and perform needed action such as sending the
appropriate application level message).

2) Response option conditions
This field indicates response options to the session
15 management (SM) message:

• "immediately"; in which case the Gateway GPRS Support
   Node GGSN sends the session management (SM) response
   message immediately (but it may still wait for some
   other signaling such as RADIUS if applicable);

20 • "only when application message response is received";
   the Gateway GPRS Support Node GGSN will prepare the
   session management (SM) response, but wait to receive
   the response from the application server. Based on the
   response of the application server, the Gateway GPRS
25 Support Node GGSN will generate an encapsulated
   application level message which it will include in its
   own session management (SM) response. For example, this
   involves

       - reading the User Datagram Protocol (UDP) port
30   and copying in appropriate encapsulated
          application level message field;
       - stripping away IP/UDP header;
       ┤ including the content of the User Datagram
          Protocol (UDP) packet in the encapsulated

application level message content field; as
well as
- using IP/UDP header info to properly set Port
  number to be used for sending.
5   Note that this field is applicable only for a session
management (SM) request message and not for a response
message.

3) The Protocol to be used for sending
10 In case of:
    • IPv4/UDP: The Gateway GPRS Support Node GGSN will
      include the encapsulated application level message
      content field in a IPv4/UDP packet;
    • IPv6/UDP: The Gateway GPRS Support Node GGSN will
15   include the encapsulated application level message
      content field in a IPv6/UDP packet;
    • IPv4/TCP: The Gateway GPRS Support Node GGSN will
      include the encapsulated application level message
      content field in a IPv4/TCP (Transfer Control Protocol)
20   packet; and
    • IPv6/TCP: The Gateway GPRS Support Node GGSN will
      include the encapsulated application level message
      content field in a IPv6/TCP packet.

25 It is remarked that it is one alternative to omit this
field, so that the User Datagram Protocol (UDP) is always
used and the Packet Data Protocol (PDP) type indicates
IPv6 (Internet Protocol version 6) or IPv4 (Internet
Protocol version 4).

30
Another alternative is to have a more detailed indication
such as that the Gateway GPRS Support Node GGSN will
include the encapsulated application level message
content field in a Session Initiation Protocol (SIP)
35 register message over IPv6/UDP.

Still another alternative is that the address type
indicates the lower level protocol: IPv4 or IPv6.

5   It is remarked that other protocols may be indicated such
as L2TP/PPP (Layer 2 Transfer Protocol – Point to Point
Protocol).

4) Port number to be used for sending
10   The use of this port is to limit the need of a Gateway
GPRS Support Node GGSN to know about the application
protocol. So this field indicates to the Gateway GPRS
Support Node GGSN if a fixed User Datagram Protocol (UDP)
port is to be used (including the value) or if the User
15   Datagram Protocol (UDP) port needs to be selected from a
certain range.

5) Setting the Traffic Flow Template (TFT) condition
If the mobile terminal UE indicates the destination
20   address with a logical name, it cannot restrict the
traffic for this Packet Data Protocol (PDP) context only
for this destination address. Thus, this field is used to
indicate that only the traffic coming from the
destination address (which is to be derived from the
25   Gateway GPRS Support Node GGSN based on the logical name)
on this Packet Data Protocol (PDP) context shall be
allowed. It is remarked that the Packet Data Protocol
(PDP) context signaling would be one use case for this
feature. This field can have the contents:
30   • Destination address type – This indicates if the
     address is a logical name, an IPv6 or IPv4 address; and
   • Application level option content – This field includes
     the actual content that the Gateway GPRS Support Node
     GGSN relays from the session management (SM) message to
35   the application level message it generates. In one

preferred embodiment, this is a Session Initiation
Protocol (SIP) message.

The invention is not limited to this format of
5 encapsulated application level message. A simple
implementation may be preferred where the GGSN behavior
is simplified. For example, the GGSN may always forward
the application message if the PDP context is accepted;
it may always wait a certain time for an answer from the
10 application server.

Besides, it is remarked that in the case where a mobile
terminal UE is connected to a laptop, the mobile terminal
UE could perform a similar function as the Gateway GPRS
15 Support Node GGSN. In this case, some fields which are
not applicable should be ignored.

Also the format may be different in uplink and downlink
direction. For example, to simplify the behavior of the
20 mobile terminal UE, the GGSN may still include the full
message (i.e. including IP header) received by the
application server in the response message as described
above. But for the uplink, it may be more beneficial to
not include the IP header, as the mobile terminal UE may
not yet know its dynamic address at the time of sending
25 not yet know its dynamic address at the time of sending
the session management (SM) request and it may not know
the real IP address of the application server.

It should be noted that this feature is specially
30 advantageous for the network requested PDP context
activation. This procedure is triggered by an IP packet
arriving at the GGSN. Currently, the packet is stored in
the GGSN and can be delivered to the mobile terminal UE
over a normal PDP context only after a lot of signaling
35 (including PDP context activation). One of the problems

is that when the mobile terminal UE receives the Request
PDP Context Activation, it does not know which message
has triggered the application. Thus, the mobile terminal
UE has too little information to decide whether to
5   activate a new PDP context or not. However, according to
the present invention, the full IP message could be sent
to the mobile terminal UE. Therefore, in addition to
saving round trip on the radio, it also provides more
information to the mobile terminal UE. That is, e.g. the
10 GGSN encapsulates the message received by the server in
the message called PDU notification sent to the SGSN. The
SGSN copies encapsulated information in the message
called "Request PDP Context Activation" and sends it to
mobile terminal UE.

15   It should be noted that the amount of encapsulated
application level message should be recorded in the
charging record.

20 What is described above is a method of carrying an
application level message encapsulated inside a signaling
message of an access network, said method comprising the
steps of: receiving an application level message from a
sender application process to an access network signaling
25 process; adapting said application level message and
encapsulating it in a signaling message of an access
network; and delivering said encapsulated application
level message to a receiver application process by
transmitting said signaling message, wherein said
30 encapsulated application level message is transparent to
the means of said access network transmitting said
signaling message.

    Although it is described above what are the preferred
35 embodiments of the present invention, it is apparent to

those skilled in the art that various modifications are
possible without departing from the scope of the present
invention as defined by the appended claims.

Claims

1. A method of carrying an application level message
encapsulated inside a signaling message of an access
5   network, said method comprising the steps of:
        receiving (1) an application level message from a
    sender application process to an access network signaling
    process;
        adapting (3) said application level message and
10 encapsulating it in a signaling message of an access
    network; and
        delivering (1, 3, 4) said encapsulated application
    level message to a receiver application process by
    transmitting said signaling message, wherein said
15 encapsulated application level message is transparent to
    the means of said access network transmitting said
    signaling message.

2. A method according to claim 1, wherein said sender
20 application process is performed in a mobile terminal
    being attached to said access network.

3. A method according to claim 1, wherein said sender
    application process is performed in a server providing a
25 corresponding application.

4. A method according to any one of claims 1 to 3,
    wherein said application level message includes an
    indication under which conditions the signaling message
30 should be delivered.

5. A method according to claim 4, wherein said indication
    comprises an address of the application receiver process
    being one of the group comprising a logical name, an IP
35 address, and a port number.

6. A method according to claim 4 or 5, wherein said indication comprises another indication whether said signaling message should be delivered even if the
5   Quality-of-Service changes.

7. A method according to claim 1, wherein said method is implemented in a call establishment procedure for Voice over the Internet Protocol (VoIP).

10

8. A method according to claim 1, wherein said encapsulated application level message is included in an activation request within a Packet Data Protocol (PDP) context signaling.

15

9. A method according to claim 3, wherein said application server is one of the group of proxy call state control function means (P-CSCF), push proxy server means, and instant message server means.

20

10. A method according to claim 8, wherein said packet data protocol (PDP) context signaling is embedded into one of the group of a Session Initiation Protocol (SIP) signaling, a Resource Reservation Protocol (RSVP) 25   signaling, and a Point to Point Protocol (PPP) signaling.

11. A method according to claim 8, wherein said encapsulated application level message includes a complete Session Initiation Protocol (SIP) message.

30

12. A method according to claim 11, wherein a Gateway GPRS Support Node (GGSN) creates a Internet Protocol/User Datagram Protocol header and forwards said complete Session Initiation Protocol (SIP) message to a Session 35   Initiation Protocol (SIP) proxy means.

13. A method according to claim 12, wherein said header is created by using information sent in an optional application level message information element.

5 14. A method according to claim 12, wherein said header is' created by using information coming from said Packet Data Protocol (PDP) context signaling.

10 15. A method according to claim 12, wherein said header is created by using information coming from a configuration process.

16. A method according to claim 8, wherein
15   said encapsulated application level message indicates that a Gateway GPRS Support Node (GGSN) shall send a context response message only when a response of said receiver application process is received, as a reaction to which said Gateway GPRS Support Node (GGSN)
20 starts a timer to wait for answer; and wherein
        a reply before the expiry of said timer is copied as a new encapsulated application level message in said context response message, and in case of no reply before the expiry of said timer an indication that said receiver
25 application process does not answer is copied as a new encapsulated application level message in said context response message.

17. A method according to claim 8, wherein
        said encapsulated application level message
30 indicates that a Gateway GPRS Support Node (GGSN) shall send a context response message immediately, as a reaction to which said Gateway GPRS Support Node (GGSN) sends a context response message immediately, whereas a
35 response of said receiver application process is returned

to said sender application process in a non-encapsulated
manner as normal traffic.

18. A system adapted to perform a transmission of an
5 application level message encapsulated inside a signaling
message of an access network, comprising:
      receiving means adapted to receive an application
level message from a sender application process to an
access network signaling process;
10   adapting means for encapsulating said application
level message in a signaling message of an access
network; and
      delivering means adapted to deliver said
encapsulated application level message to a receiver
15 application processing means.

19. A system according to claim 18, further comprising a
server adapted to perform said sender application
process.

20
20. A system according to claim 19, wherein said server
is one of the group of proxy call state control function
means (P-CSCF), push proxy server means, and instant
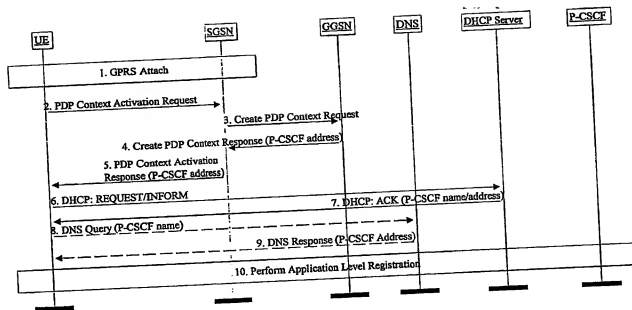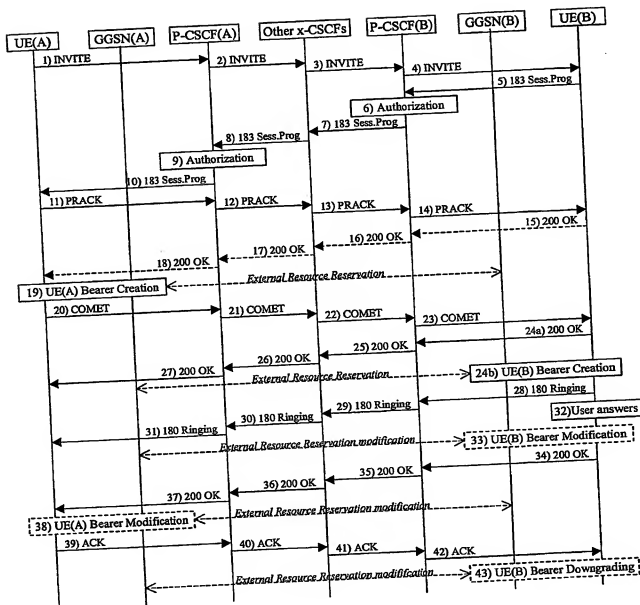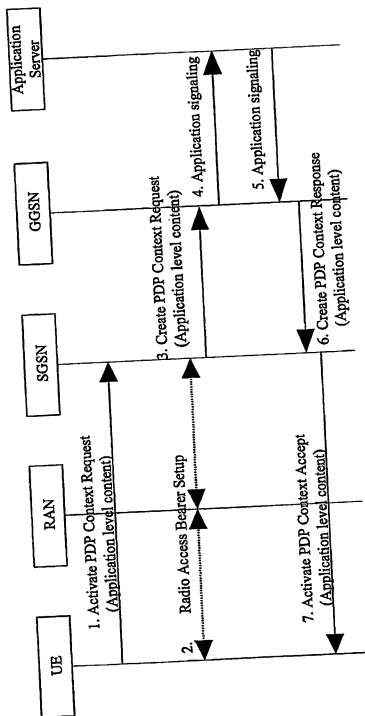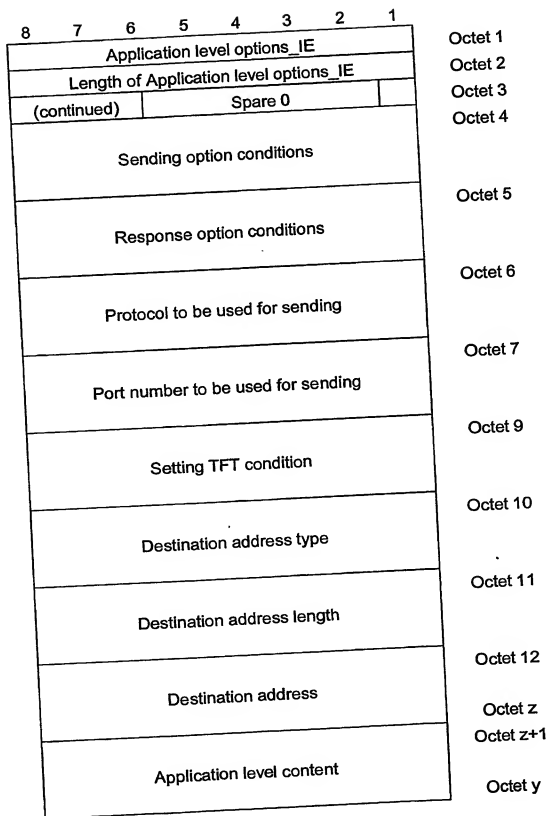message server means.

25

FIG. 1

FIG. 2

FIG. 3

8	7	6	5	4	3	2	1	
Application level options_IE								Octet 1
Length of Application level options_IE								Octet 2
								Octet 3
(continued)			Spare 0					Octet 4
Sending option conditions								Octet 5
Response option conditions								Octet 6
Protocol to be used for sending								Octet 7
Port number to be used for sending								Octet 9
Setting TFT condition								Octet 10
Destination address type								Octet 11
Destination address length								Octet 12
Destination address								Octet z
Octet z+1
Application level content								Octet y

FIG. 4